

**AMERICAN SOCIETY OF HEATING, REFRIGERATING AND
AIR-CONDITIONING ENGINEERS, INC.
1791 Tullie Circle, NE Atlanta, GA 30329 404-636-8400**

TC/TG/TRG MINUTES COVER SHEET

(Minutes of all meetings are to be distributed to all persons listed below within 60 days following the meeting.)

TC/TG/TRG NO. TC 7.5 DATE: February 10, 2005

TC/TG/TRG TITLE: Smart Building Systems

DATE OF MEETING: June 29, 2004 LOCATION: Nashville, TN

Members Present	Appt	Members Absent	Appt	Ex-Officio Members and Additional Attendance
John House, Chair (V)	03-05	Arthur Dexter, International member (V)	01-05	David Bornside
Osman Ahmed (V)	02-06	Cliff Federspiel (V)	02-06	Ken Gillespie
Michael Brandemuehl (V)	03-07	Rich Hackner, Program Subc. (V)	01-05	Bill Healy
James Braun (V)	03-07			David Holmberg
Natascha Castro, Testing & Evaluation Subc, Web Master (V)	02-04			Mark Johnson
James W. Gartner (V)	03-07	Corresponding Members		Bill Koran
Carlos Haiad (V)	00-04	Barry Bridges, CM	02-	Nick Kyriakopedi
Phil Haves (V)	01-05	Marty Burns, CM	02-	Vance Payne
Srinivas Katipamula; Tech. Dev. Subc. Chair (V)	01-05	Jim Butler, CM	02-	Ashish Singhal
Agami Reddy (V)	02-06	Maria Corsi, CM	03-	Robert Sonderegger
Jonathan Wright (V)	03-07	Charles Culp, CM	00-	Gene Strehlow
		Thomas Engbring, CM	99-	Ryan Stroupe
Corresponding Members		David Kahn, CM	96-	Jim Wen
Steve Blanc, CM	03-	Michael Kintner-Meyer, CM	03-	Miao Yang
Mike Brambley, Vice Chair, Research Subc Chair (CM)	03-	Mingshang Liu, CM	03-	
Dave Branson, CM	01-	Carol Lomonaco, CM	00-	
George Kelly, CM	00-	Darrell Massie, CM	03-	
Les Norford, Handbook Subc., CM	02-	John Mitchell , CM	00-	
Robert Old, CM	01-	Ron Nelson, CM	98-	
Todd Rossi, Secretary, CM	03-	Hung Mahn Pham, CM	01-	
Pornsak Songkakul, CM	02-	Kinga Porst, CM	02-	
Keith Temple, CM	03-	Mike Pouchak, CM	03-	
James Winston, CM	02-	Andrew Price, CM	03-	
Peng Xu, Comm. & Int. Subc. Chair, CM	02-	Barry Reardon, CM	99-	
		Glenn Remington, CM	02-	
		John Seem, CM	03-	
		Chariti Young, CM	02-	
		Xiaohui Zhou, CM	03-	

(V) = voting member, Membership status as of 8/4/03

DISTRIBUTION:

ALL MEMBERS AND CORRESPONDING MEMBERS OF TC/TG/TRG,

TAC CHAIR: William Bahnfleth

TAC SECTION HEAD: Janice Peterson

ALL COMMITTEE LIAISONS AS SHOWN ON TC/TG/TRG ROSTERS:

Program: Frank Schambach

Standards: Richard Hermans

Research: Patrick Hughes

Special Publications: Kimball Ferguson

CTT: Kenneth Rhoden

Staff Liaison (Std): George Reeves

Prof. Dev.: Mark Hydeman

Staff Liaison (Resch/Tech Srvc): Michael Vaughn

"These draft minutes have not been approved and are not the official, approved record until approved by this (council/committee)."

ASHRAE TC Activities Sheet

DATE: June 29, 2004

TC NO. TC 7.5

TC TITLE: Smart Building Systems

CHAIR: John House

VICE CHAIR: Mike Brambley

TC Meeting Schedule

Location, past 12 mo.	Date	Location, next 12 mo.	Date
Anaheim	1/27/04	Orlando	2/8/05
Nashville	6/29/04	Denver	6/28/05

TC Subcommittees

Subcommittee	Chair
Technology Development	S. Katipamula
Communications and Integration	P. Xu
Testing & Evaluation	N. Castro
Research	M. Brambley
Program	R. Hackner

Past Research Projects (last 3 years)

1139-RP Development and Comparison of On-Line Model Training Techniques for Model-Based FDD Methods Applied to Vapor Compression Equipment

Current Research Projects

Technology Development Subcommittee

1275-RP "Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II" (Phil Haves – PMSC Chair)

Testing and Evaluation

1274-RP "Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service" (Todd Rossi – PMSC Chair)

1312-TRP "Tools for Evaluating FDD Methods for Air Handling Units" - **Conditionally Approved**

2004 – 2005 Research Plan (approved June 29, 2004)

Priority	Project	Contribution	Status
1	Fault Detection and Diagnostics for Centrifugal Chillers – Phase 3: Real-Time Implementation	Srinivas Katipamula, John House, Todd Rossi, Jim Braun, Natascha Castro	Prioritized. RAC recommended waiting to submit workstatement until Phase 2 is completed. Will work on scope of work for Orlando.

2	Design and Demonstration of a Self-Configuration Concept for an HVAC Control System	Michael Kintner-Meyer	Draft discussed in Anaheim and suggestions made for substantial revision. No progress for Nashville.
3	FDD for Supermarket Refrigeration	Daniel Choiniere	Draft RTAR presented at the Anaheim meeting, no change at the Nashville meeting. Updated RTAR will be emailed to members in December before the Orlando meeting.
4	Added-Value of Wireless Temperature Sensor Network in a Building	Jin Wen and Agami Reddy	New draft RTAR prepared for Nashville meeting. RTAR will be updated to address comments and feedback from members. Updated RTAR will be emailed to members in December for review before the Orlando meeting.
5	Universal Chiller Model for FDD Training and Testing	Agami Reddy	New idea, no RTAR. Agami will draft an RTAR and email it to members in December before the Orlando meeting.
6	Whole-Building FDD	Les Norford	Idea proposed in Honolulu. No RTAR has been drafted yet, but Les volunteered to work on it and provide a draft by December 2004.
7	Smart Sensor Systems for Reducing Bias Errors in the Measurement of Air Temperatures and Flows in Air-Handling Units	Arthur Dexter and Phil Haves	One-page description written. No progress to report at the Nashville meeting.
8	Resolving Discrepancies Between Multiple, Hierarchically-Related, Fault Detection and Diagnostics Systems	Mike Brambley and Todd Rossi	Draft RTAR written. On hold. No progress to report.

Co-sponsored RTARs

	Real-Time Optimal Control in a Distributed Environment	Jim Braun, George Kelly, Maria Corsi	RTAR submitted by TC 7.4, TC 7.5 is co-sponsor. RTAR has been approved. Jonathan Wright will draft a WS for the Orlando Meeting.
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Other Non-Prioritized Topics Proposed

- Prototyping and Field Testing of Utility-Consumer Information Services – Michael Kintner-Meyer and Marty Burns
- Integrating data in computer-based maintenance management systems with energy management and control systems.

Technical Papers from Sponsored Research

RP-1011

Final report for ASHRAE Research Project RP-1011, "Utility/Energy Management and Control Systems (EMCS) Communication Protocol Requirements" is available on the TC 7.5 web site.

RP-1020

Norford, L. K., J. A. Wright, R. Buswell, and D. Luo. 2000. "Demonstration of Fault Detection and Diagnosis Methods in a Real Building (ASHRAE 1020-RP)." ASHRAE 1020-RP Final Report.

Luo, D., L. K. Norford, S. R. Shaw, and S. B. Leeb. 2002. "Monitoring HVAC Equipment Electrical Loads from a Centralized Location - Methods and Field Test Results." ASHRAE Transactions Vol. 108(1).

Shaw, S. R., L. K. Norford, D. Luo, and S. B. Leeb. 2002. "Detection of HVAC Faults via Electrical Load Monitoring." International Journal of HVAC&R Research, 8(1):13-40.

Norford, L.K., J. A. Wright, R. A. Buswell, D. Luo, C. Klaassen, and A. Suby. 2002. "Demonstration of Fault Detection and Diagnosis Methods for Air-Handling Units (ASHRAE 1020-RP)." International Journal of HVAC&R Research, 8(1):41-72.

RP-1043

Final report for ASHRAE Research Project RP-1043, " Fault Detection and Diagnostic Requirements and Evaluation Tools for Chillers" is available on the TC 7.5 web site.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "The Sensitivity of Chiller Performance to Common Faults," International Journal of HVAC&R Research, Vol. 7, No. 3, pp. 263-279, 2001.

Technical paper from 1043-RP, Comstock, M.C., Braun, J.E., and Groll, E.A., "A Survey of Common Faults for Chillers," ASHRAE Transactions, Vol. 108, Pt. 1, 2002.

RP-1139

Andersen, K.K., and Reddy, T.A., 2002. "The Error in Variable (EIV) Regression Approach as a Means of Identifying Unbiased Physical Parameter Estimates: Application to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.3, pp. 295-309, July.

Reddy, T.A. and Andersen, K.K., 2002. "An Evaluation of Classical Steady-state Off-line Linear Parameter Estimation Methods Applied to Chiller Performance Data", International Journal of HVAC&R Research, vol.8, no.1, pp.101-124.

Reddy, T.A., Niebur, D., Andersen, K.K., Pericolo, P.P. and Cabrera, G., 2003. "Evaluation of the Suitability of Different Chiller Performance Models for Online Training Applied to Automated Fault Detection and Diagnosis", International Journal of HVAC&R Research, Vol.9, No.4, pp. 365-384, October.

Reddy, T.A., Andersen, K.K. and Niebur, D., 2003. "Information Content of Incoming Data During Field Monitoring: Application to Online Chiller Modeling", International Journal of HVAC&R Research, Vol.9, no.4, pp.385-414, October.

TC Sponsored Symposia (past 3 years, present, planned)

Title	Date (Given or Planned)
Recent Results from Fault Detection and Diagnostic Research (Norford)	Atlanta, 1/01
HVAC Diagnostics: Development to Implementation Part 1 (House)	Atlantic City, 1/02
HVAC Diagnostics: Development to Implementation Part 2 (Dexter)	Atlantic City, 1/02
FDD, Operation and Maintenance of HVAC Systems (Kelly, TC 1.4 co-sponsor)	Kansas City, 6/03
Automated Functional Testing: Methodologies and Air-Handling Unit Applications (House)	Orlando, 1/05

TC Sponsored Seminars (past 3 years, present, planned)

Title	Date (Given or Planned)
Diagnostics from an Operations Perspective, Needs and Experiences (Rossi)	Atlanta, 1/01
Adding New Life to Old System-Control Retrofit Case Studies (TC 1.4 lead)	Atlanta, 1/01
Maximizing Facility Performance with Computerization and Controls (Gartner)	Cincinnati, 6/01
Data Modeling for Building Operations (Kintner-Meyer)	Cincinnati, 6/01
BACnet Manufacturers Association (BMA)- New role in Testing Interoperability of BACnet Systems (Newman)	Cincinnati, 6/01
Wireless DDC Systems (TC 1.4, Bridges lead)	Cincinnati, 6/01
Intelligent Agents - What They Can Do For You (Ahmed, TC 4.6 co-sponsor)	Honolulu, 6/02
Self-Configuring Control Systems: Technology and Potential Benefits (Brambley, TC 4.6 co-sponsor)	Honolulu, 6/02
Experience with Demand Responsiveness Programs (Haves, TC 4.6 co-sponsor)	Honolulu, 6/02
New Issues in State of the Art DDC Systems (Atkinson, TC 1.4 co-sponsor)	Honolulu, 6/02

Automated Functional Testing of HVAC Systems (Haves, TC 1.4 and 4.6 co-sponsors)	Chicago, 1/03
New Issues with State-of-the-Art DDC (Atkinson, TC 1.4 and 1.5 co-sponsors)	Chicago, 1/03
Wireless Sensors for Building Applications (Healy, TC 1.4 co-sponsor)	Kansas City, 6/03
Improved Operations for California Buildings -Part 1 (Haiad, TC 7.4 lead)	Anaheim, 1/04
Improved Operations for California Buildings -Part 2 (Scruton, co-sponsored with TC 7.4)	Anaheim, 1/04
Automated Commissioning Tools (Maria Corsi, co-sponsored with TC 7.3)	Anaheim, 1/04
State of the Art Issues for DDC Systems (Atkinson, TC 1.4 lead)	Anaheim, 1/04
Models for Automated Building/HVAC Fault Detection and Diagnostics (Brambley, co-sponsored with TC 4.7)	Nashville, 6/04
Demand Response and Building Control (Xu, TC 7.4 lead)	Nashville, 6/04
Control Challenges and Opportunities with Emerging DDC Technologies (Bridges, TC 1.4 lead)	Orlando, 1/05
Future Intelligent Control Systems: They are Here Today (Braun, TC 7.4 lead)	Orlando, 1/05

TC Sponsored Forums (past 3 years, present, planned)

Title	Date (Given or Planned)
Specifying Open Lonmark DDC Systems	Atlantic City, 1/02
What Should ASHRAE's Role be in IFC and XML Standards (Gowri, GPC20 and TC 1.5 cosponsor)	Chicago, 1/03
Achieving Market Acceptance of HVAC Fault Detection and Diagnostic Systems (Goetzler, co-sponsored with TC 7.4)	Orlando, 1/05

TC Sponsored Public Sessions (past 3 years, present, planned): None

Journal Publications (past 3 years, present, planned): None

TC 7.5 Minutes

June 29, 2004 - Nashville, TN

Call to Order, Roll Call, Introductions

The meeting was called to order at 3:35 PM with Chairman John House presiding. Roll call was taken with 11 of 14 voting members in attendance. House distributed the Agenda (the call-to-meeting letter and the agenda are in Appendix A).

Committee Scope

The Chair read the committee scope for the benefit of all in attendance. (see Appendix B) A question arose as to whether the scope of committee included residential buildings. House noted that the focus to date has been on commercial buildings and invited those interested in residential applications to propose topics at the subcommittee meetings.

Approval of Minutes

Todd Rossi distributed copies of the minutes for review. House provided editorial/formatting corrections. Natascha Castro suggested it would be useful to include PMS chair and contractor for TC sponsored research projects.

Motion: Move to approve minutes subject to editorial and format changes (Motion: Castro, Second: Haiad). Vote: 10/0/0 chair not voting.

Chair's Announcements (John House):

1. ASHRAE is recording seminars at this meeting. All presentations will be downloaded to a single computer for presentations. Recordings of the seminars will be packaged and sold. Speakers can ask that their seminar not be recorded. No directive has been given concerning whether or not TC's can still post seminars on the TC web sites.
2. The seminar evaluation forms have been simplified from the past. This will reduce the burden on seminar chairs when they complete the seminar summary forms.
3. The program committee is considering adjusting the schedule for when symposia will be due to ASHRAE to allow extra time to get symposia delivered.
4. Effective July 1, Patrick Hughes of Oakridge National Research Laboratory will take over as the Research Liaison for Section 7. Wayne Reedy, outgoing Research Liaison, will become Vice-Chair of RAC.
5. Effective July 1, Janice Peterson will become TAC Section Head for Section 7. Pat Graef, outgoing Section Head for Section 7, will become Section Head for Section 8.
6. The ASHRAE copyright notice should appear on minutes and any other official ASHRAE correspondence. Minutes should carry the label "draft" until they are approved by the TC.

7. CLIMA 2000 representatives announced a call for papers for the Oct. 2005 meeting in Switzerland. ASHRAE will be handling paper reviews for U.S. and Canadian papers.
 8. There will be mandatory training for all Webmasters at the Orlando meeting.
 9. Email aliases are being established for TC chairs. The alias for TC 7.5 is tc0705@ashrae.net. Inform Mike Vaughn (MORTS@ashrae.net) of changes to email addresses.
 10. Housing forms for the Orlando meeting will be emailed in September.
- Attend Form 18. This morning (too late). ASHRAE strategic plan. Srinivas: Decide on major areas for ASHRAE's strategic research plan. Published Oct and sent to TC chairs and members. Orlando: Open forum for TC and research chairs for input. Getting different groups together for input.
 - Les: US affiliate ABIBSA, Boulder CO in July 2004.

Technology Development Subcommittee (Srinivas Katipamula)

Srinivas Katipamula began his report by providing a summary of the four main items to be discussed:

- RP-1275 update
- RTAR on wireless
- Supermarket FDD
- New ideas

RP-1275 - Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II, Drexel University

Report to Technology Development Subcommittee: No update from the PMS at the subcommittee meetings Sunday because PMS meets right before the main committee meeting on Tuesdays. Agami Reddy, PI, provided a brief summary at the subcommittee meeting. Reddy reported that the project started late due to administrative delays, awarded October and started in January. He met with the PMS in January at Anaheim. At the meeting PMS committee requested that updated/revised plan be submitted before the Nashville meeting, which was done. Reddy also indicated that he submitted a progress report to PMS along with the revised plan. Overall, he indicated they made good progress in the selection of the FDD methods to be evaluated.

PMSC Report – Phil Haves: The project started in January 2004, having been delayed in the contracting phase.

A need for a PMS member from TC8.2 (Centrifugal Machines) was identified.

Four diagnostic methods for chillers will be evaluated:

1. Model-free (heuristic) - look-up tables of characteristic quantities and characteristic parameters

2. Polynomial model for fault detection with look-up tables for fault diagnosis
3. Principal Component Analysis model for fault detection with look-up tables for fault diagnosis
4. Gordon and Ng lumped parameter model for fault detection

Comparative testing of the four methods will be done with laboratory and simulation data generated in 1043-RP.

The PMS identified the need to include criteria related to both implementation and training difficulty in the procedure used to evaluate the four methods.

Added Value of Wireless Temperature Sensor Networks in a Building

- Jin Wen and Agami Reddy are authors of the this research idea
- The objective is to assess the need for new control strategies as new low-cost wireless sensor are introduced.
- The research would answer
 - what sensors to use to be cost effective?
 - optimal locations?
 - new control strategies using multiple sensors to control component
- Steve Blanc suggested that there is a need to address topology of wireless sensors (gathering points) and what changes need to be made to DDC to make use of additional sensors.
- Mike Brambley suggested it is important to focus RTAR on subset of problem and target a portion that has not been addressed.
- Agami Reddy suggested that there is benefit in distilling other proof-of-concept work for ASHRAE.
- Peng Xu indicated that problem of exploring capabilities of additional sensors are independent of wireless technology.
- Mike Brambley suggested that there may be two separate, complementary projects: 1) general study of what could be done with more/better data, and 2) issues with wireless potential use.
- Several good comments and suggestions were provide on how to restructure and focus the RTAR
- Additional comments and suggested changes to the RTAR should be provide to Jin Wen (Drexel) by September 1st, 2004.
- Jin will revise the RTAR by December and email them to all members by December 2004.
- Mike Brambley volunteered to review the RTAR.

FDD in Supermarket

- Daniel Choniere prepared a draft RTAR that was discussed at the last subcommittee meeting in Anaheim.
- No progress to report at this meeting.
- Daniel agreed to update the draft RTAR and circulate it for comments in December before the next meeting.

Real-Time Optimal Control in a Distributed Environment

- TC 7.4 is the lead on this topic, no progress to report.

Whole-Building FDD

- RTAR hasn't been drafted; Les Norford indicated that he would draft a RTAR for the next meeting.

Communications and Integration Subcommittee – Peng Xu

Peng Xu reported that the subcommittee spent most of its meeting revisiting the history of the subcommittee and brainstorming for new ideas. Three new ideas were identified as important areas for the further research work of this subcommittee. These are:

1. Carlos Haiad suggested a project involving the development of demand limiting strategies for various building types, in response of a certain amount of shed required. This might include small buildings, large buildings, and residential buildings. Haiad agreed to write a short description of the research topic before the Orlando meeting.
2. Development of a "What if" predictive control tool. What is the consequence of certain actions by building operators? One idea is to populate the database generated from simulation. Problem: how to be more generic? How will a rule-of-thumb apply to individual buildings? Steve Blanc will write a short description of this research topic before the Orlando meeting.
3. Development of a "What to do" tool. What should building operator do under certain demand-limiting requirement? Les Norford will write a short description on "short-term load control in building via HVAC setpoint adjustment".

A discussion of the workstatement "Design and Demonstration of a Self-Configuration Concept for an HVAC Control" ensued. Michael Kintner-Meyer provided a summary of the objective and scope of work. Mike Brambley volunteered to work with Kintner-Meyer to revise the workstatement for the next meeting based on comments from past discussions. House suggested TC 1.4 should be made aware of the workstatement and invited to participate. Anyone interested in contributing should contact Brambley or Kintner-Meyer.

Testing and Evaluation Subcommittee Report – Natascha Castro

- Todd Rossi provided a report on 1274-RP (see other notes). Brambley: Lack of clarity on how units to repair will be selected. Discussion on if units that are not working will the big issues be fixed before baseline. John: PI to provide a written test plan for approval.
- *WS-1312 titled "Tools for Evaluating FDD Methods for Air-handling Units"*
In the subcommittee meeting, John House reported on the status of the workstatement, which is co-sponsored by TC 1.4, TC 7.3, and TC 7.4. The WS was conditionally approved and will move forward as soon as the forward model of the cooling coil is completed (RP-1194). Jim Braun indicated that the model should be completed and documented by late Fall 2004. Model is completed, but

validation is not done yet.

- *RTAR titled “Fault Detection for Centrifugal Chillers - Phase 3: Real-Time Implementation”*

Srinivas summarized the RTAR. The RTAR was prioritized by RAC, however, RAC suggested that the TC delay submitting a work statement until the second phase of the chiller FDD research (RP-1275-RP) is completed. This is currently 18 months off. Volunteers were identified in the subcommittee to draft the scope of work for Orlando. Mike Brandemehl indicated that TC 8.2 is interested in participating. Riyaz Papar (research subcommittee chair) should be contacted for TC 8.2.

1274-RP Report – Todd Rossi

- Comfort Systems contractors represent a diverse enough group (consolidated contractors, different techs) to provide random sampling of units in 4 climate areas. They will include service contract and emergency service units.
- PI will provide a work statement including data survey form and detailing data collection procedure for us to review in two weeks. We will finalize procedure by 8/1/04 so they can start data collection. They will do 75 out of 375 units in Sacramento this year - the rest in 2005. Data will be available on-line during August and September 2004 for PMS feedback during data collection.
- There will be as much surprise as possible before initial audit so units are not "prepared". The "bad" units will be repaired with all available data and expertise to get them working as well as possible.
- All required repairs will be performed to make each unit work as well as possible – not try to isolate impact individual fixes (e.g. conditioner coil cleaning). Not enough units to statistically isolate individual fault effects.
- ADM personnel to collect data directly with their tools while on roof with technician.
- Make and model will be kept internally to match manufacturer data to units, but this will be kept confidential to contractor and manufacturer references will never be reported to ASHRAE.
- PI to contact Martha Hewitt for offered literature review data.
- Audit data will be referenced to “After Service” and “Manufacturer Benchmark Data” (name plate). Before and after data will be collected on the same day and under the same driving conditions as much as possible.
- Capacity measured on air side. Hot-wire anemometer in multi point grid to measure velocity. Maybe measure temp and humidity distribution if significant variation seen.

- Reports to be defined in work statement. Nationwide “average” (weighted by unit density) and report for each climate zone. We want to be careful not to report results that may be misused or misquoted.

Research Subcommittee – Mike Brambley

Brambley reported the following from the Research Subcommittee Chairs breakfast:

- Patrick Hughes is the new Section 7 research liaison.
- RTARS are due August 1. Submit up to two. Section 7 TCs need to run these by Patrick Hughes before submission.
- RAC is accepting nominations for the award for service to research. Nomination forms can be found on the web site.
- RTARs are suggested to be 2 pages in length with a maximum of 3 pages. Do not exceed three pages.
- There is a new Work Statement cover sheet. In reporting TC votes, all abstentions need to be explained.
- Mike provided an overview of the research project prioritization system under development by RAC. It currently provides the following weights by category:

<input type="checkbox"/> Support of Society (RAP) Research Plan	45%
<input type="checkbox"/> Anticipated Application of Results	10%
<input type="checkbox"/> Co-funding Support	10%
<input type="checkbox"/> TC Vote	10%
<input type="checkbox"/> RAC Vote	10%
<input type="checkbox"/> Tech Council Preview Feedback	5%
- Some statistics on RTARs and Work Statements:
 - ☐ 50-60 RTARs were submitted last summer. About 18 were accepted. Most were returned with comments.
 - ☐ 10 work statements were evaluated at this meeting. One was accepted, and 3 were conditionally accepted.

Brambley distributed the 2003-2004 research plan and the proposed 2004-2005 plan developed in the Research Subcommittee Meeting on Sunday without priorities assigned. The committee assigned priorities to research topics as follows:

1. Fault Detection and Diagnostics for Centrifugal Chillers – Phase 3: Real-Time Implementation
2. Design and Demonstration of a Self-Configuration Concept for an HVAC Control
3. FDD for Supermarket Refrigeration
4. Added-Value of Wireless Temperature Sensor Network in a Building
5. Universal Chiller Model for FDD Training and Testing
6. Whole-Building FDD
7. Smart Sensor Systems for Reducing Bias Errors in the Measurement of Air Temperatures and Flows in Air-Handling Units
8. Resolving Discrepancies Between Multiple, Hierarchically-Related, Fault Detection and Diagnostics Systems

MOTION: Move to approve the 2004-2005 research plan as prioritized (Motion: Gartner, Second: Haves). 10/0/0 chair not voting.

Brambley asked for volunteers to participate in discussing and drafting a revision to the Long-Term Research Plan between this meeting and the next meeting in Orlando.

Volunteers to participate in this activity are:

Steve Blanc
John House
Srinivas Katipamula
Peng Xu
Natascha Castro
Phillip Haves
Jim Braun
Carlos Haiad
Michael Brandemuehl

- A discussion ensued concerning adjusting the amount of time allotted for the subcommittees to provide additional time for research planning and to provide time for handbook. It was decided that at the next meeting the Technology Development, Communications and Integration, and Testing and Evaluation subcommittees would be shortened to 40 minutes each, with 10 minutes in each subcommittee meeting devoted to program. The Research subcommittee will be given 45-50 minutes and handbook will be given 10-15 minutes. Subcommittee chairs were asked to respect time constraints and yield time to other subcommittees when possible.

Program Subcommittee – Peng Xu for Rich Hackner

Peng Xu (substituting for Rich Hackner) led a discussion of program topics for Orlando. The program topics were prioritized as follows:

1. Forum: “What is needed to achieve wide spread market acceptance for FDD” – Moderator: Bill Goetzler
2. Seminar: “In 2010, what will you building have to say and who will listen” – Chair: Phil Haves
3. Forum: “What does the utility want to do to your building and how do you benefit” – Moderator: Michael Kintner-Meyer

MOTION: Move to approve the program plan as prioritized (Motion: Haves, Second: Gartner). 9/0/0 chair not voting.

Other program topics discussed included the following:

- Seminar - “How to use building data for enhanced building operation” – Chair: Mark Johnson
- Seminar - “HVAC demand response during short term power shortages”

Mark Johnson was encouraged to move ahead and to try to arrange speakers for a seminar on the topic of enhanced building operation one year from now. Agami Reddy noted that seminars frequently have scheduled speakers who fail to honor their commitment to speak and encouraged seminar chairs to do what they can to ensure this doesn't happen.

Handbook – Les Norford

- Les Norford reported that TC 7.5 does not have a chapter yet, however, there is content available from TC sponsored research. Norford has had discussions with TC 7.3 (Operations and Maintenance Management) concerning building operation issues and the possibility of their chapter (Ch. 38) being the home for unitary equipment content.

Old Business

None.

New Business

Gartner noted the formation of the Chapter Technology Transfer Committee and the Green Building Controls subcommittee of TC 1.4.

House announced roster updates: Natascha Castro and Carlos Haiad will be rolling off. Natascha will continue web master and chair of the Testing and Evaluation subcommittee. Steve Blanc and Bill Healy will become voting members. Changes will be effective July 1, 2004.

House requested all subcommittee chairs provide summaries of their reports to the main committee to the secretary. The secretary would then be primarily concerned with capturing important issues and discussions arising from the subcommittee reports. The idea is to ease the burden on the secretary. There was general agreement with this proposal. House asked that all subcommittee reports be provided to Todd Rossi by July 15, 2004.

Adjourn

Motion: Move to adjourn (Motion: Brandemuehl, Second: Gartner). Motion approved by unanimous voice vote.

Appendices

- A. Call to Meeting and Agenda
- B. Scope and Organization
- C. Technology Development Subcommittee Report
- D. Communications and Integration Subcommittee Report
- E. Testing and Evaluation Subcommittee Report
- F. List of Subcommittee and Committee Meeting Attendees

Appendix A. Call to Meeting and Agenda

ASHRAE American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

1791 Tullie Circle, NE, Atlanta, Georgia 30329-2305

404-636-8400 | Fax 404-321-5478

Reply to: John House
Energy Resource Station
DMACC, 2006 S. Ankeny
Ankeny, IA 50021
jhouse@energy.iastate.edu

June 8, 2004

Dear TC 7.5 Member, International Member, or Corresponding Member:

The **TC** on Smart Building Systems will meet in the Gaylord Opryland Resort & Convention Center according to the following schedule:

TC 7.5	Tech. Development	Sunday (6/27)	3:00-3:45p	Pres. Ballroom A (PM)
TC 7.5	Comm. & Integration	Sunday (6/27)	3:45-4:30p	Pres. Ballroom A (PM)
TC 7.5	Testing & Evaluation	Sunday (6/27)	4:30-5:15p	Pres. Ballroom A (PM)
TC 7.5	Research	Sunday (6/27)	5:15-6:00p	Pres. Ballroom A (PM)
TC 7.5	PMS 1274-RP	Sunday (6/27)	6:00-7:30p	Pres. Ballroom A (PM)
TC 7.5	PMS 1275-RP	Tuesday (6/29)	1:30-3:00p	Hermitage E (MM)
TC 7.5	Smart Building Systems	Tuesday (6/29)	3:30-6:00p	Hermitage E (MM)

TC 7.5 is sponsoring or co-sponsoring the following program sessions:

Seminar 32: Demand Response and Building Control (TC 7.4 sponsor; TC 7.5 co-sponsor)

Tuesday, June 29, 2004, 8:00 AM – 10:00 AM, Chair: Peng Xu

Seminar 42: Models for Automated Building/HVAC Fault Detection and Diagnostics (TC 7.5 sponsor, TC 4.7 co-sponsor)

Tuesday, June 29, 2004, 10:15 AM – 12:15 PM, Chair: Michael Brambley

Attached is a draft agenda for the full TC 7.5 committee meeting. I hope to see you all in Nashville.

John House
Chairman, TC 7.5

**ASHRAE TC 7.5, Smart Building Systems
2004 Annual Meeting
Nashville, TN**

AGENDA

Location: Gaylord Opryland Resort & Convention Center / Hermitage E (MM)

Date: Tuesday, June 29, 20012004

Time: 3:30 - 6:00 p.m.

1. Roll call and introductions
2. Approval of minutes from Anaheim
3. Announcements
4. Technology Development Subcommittee (Srinivas Katipamula)
 - Report on 1275-RP “Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II” (Phil Haves – PMSC Chair)
5. Communications and Integration Subcommittee (Peng Xu)
6. Testing and Evaluation Subcommittee (Natascha Castro)
 - Report on 1274-RP “Field Performance Assessment of Package Equipment to Quantify the Benefits of Proper Service” (Todd Rossi – PMSC Chair)
7. Research (Mike Brambley)
 - Long Range Research Plan
8. Program Subcommittee (Peng Xu)
 - Plans for Orlando (February 5-9, 2005) and Denver (June 25-29)
9. Handbook (Les Norford)
10. Old business
11. New business
 - Roster Update
12. Adjournment

Appendix B.

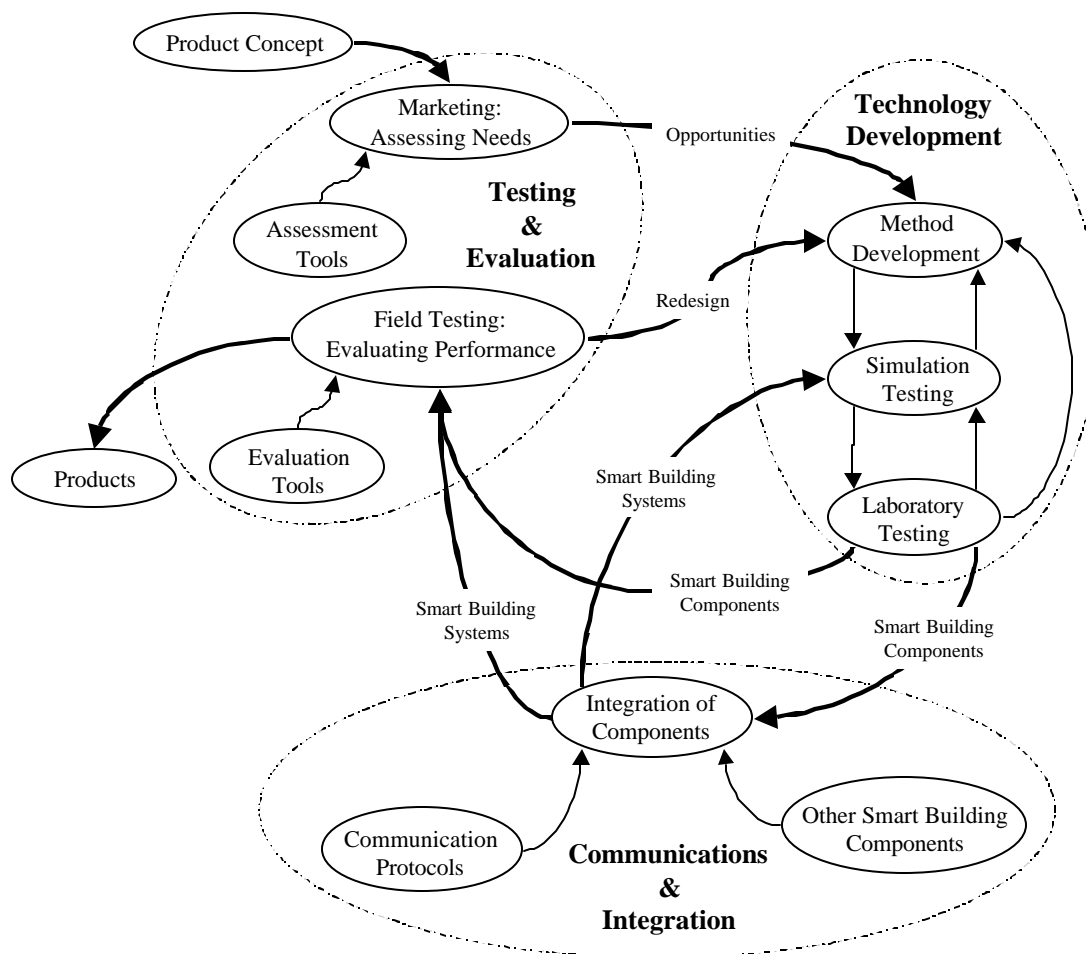
TC 7.5, Smart Building Systems Scope and Organization

Revised July 1, 2001

Overall Committee Scope

The Technical Committee on Smart Building Systems (SBS), TC 4.11, is concerned with the development and evaluation of technologies that could enable the widespread application of smart building systems. “Smart” buildings should take advantage of automation, communications, and data analysis technologies in order to operate in the most cost-effective manner. This implies integration of building services such as HVAC, fire, security, and transportation; the automation of many of the operation and maintenance functions traditionally performed by humans; and the interaction with outside service providers such as utilities, energy providers, and aggregators. Currently, three subcommittees form the backbone of the TC’s activities: technology development, communications and integration, and testing and evaluation. The scope and activities of these subcommittees loosely follow the product development process as depicted in following flow chart and as defined in the following sections.

Smart Building System Development Process



Appendix C.

TC 7.5 Technology Development Subcommittee Research

June 27, 2004, Nashville, TN
Subcommittee Chair: Srinivas Katipamula

List of attendees

(Including in the main committee minutes)

Minutes

Srinivas began the meeting by summarizing the four main items to be discussed:

- RP-1275 update
- Supermarket FDD
- RTAR on wireless
- New ideas

RP-1275 - Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II, Drexel University

No update from the PMS because PMS meets right before the main committee meeting on Tuesday June 29th. Agami Reddy, PI, provided a brief summary. Agami reported that the project started late due to administrative delays, awarded October and started in January. He met with the PMS in January at Anaheim. At the meeting PMS committee requested that updated/revised plan be submitted before the Nashville meeting, which was done. Reddy also indicated that he submitted a progress report to PMS along with the revised plan. Overall, he indicated they made good progress in the selection of the FDD methods to be evaluated.

Added Value of Wireless Temperature Sensor Networks in a Building

- Jin Wen and Agami Reddy are authors of this research idea
- The objective is to assess the need for new control strategies as new low-cost wireless sensors are introduced.
- The research would answer
 - what sensors to use to be cost effective?
 - optimal locations?
 - new control strategies using multiple sensors to control component
- Steve Blanc suggested that there is a need to address topology of wireless sensors (gathering points) and what changes need to be made to DDC to make use of additional sensors.
- Mike Brambley suggested it is important to focus RTAR on subset of problem and target a portion that has not been addressed.
- Agami Reddy suggested that there is benefit in distilling other proof-of-concept work for ASHRAE.
- Peng Xu indicated that problem of exploring capabilities of additional sensors are independent of wireless technology.
- Mike Brambley suggested that there may be two separate, complementary projects: 1) general study of what could be done with more/better data, and 2) issues with wireless potential use.
- Several good comments and suggestions were provided on how to restructure and focus the RTAR

- Additional comments and suggested changes to the RTAR should be provide to Jin Wen (Drexel) by September 1st, 2004.
- Jin will revise the RTAR by December and email them to all members by December 2004.
- Mike Brambley volunteered to review the RTAR.

FDD in Supermarket

- Daniel Choniere prepared a draft RTAR that was discussed at the last subcommittee meeting in Anaheim.
- No progress to report at this meeting.
- Daniel agreed to update the draft RTAR and circulate it for comments in December before the next meeting.

Real-Time Optimal Control in a Distributed Environment

- TC 7.4 is the lead on this topic, no progress to report.

Whole-Building FDD

- RTAR hasn't been drafted; Les Norford indicated that he would draft a RTAR for the next meeting.

Smart Sensor Systems for Reducing Bias Errors in the Measurement of Air Temperatures in AHUs

- No progress on this topic, has been around for a while, Arthur was the champion.
- Arthur will take a shot at drafting a RTAR. Charlie Culp is interested in helping as well.

New Research Topic

Agami Reddy suggested that there is a need for simplified universal chiller model.

- A tool that can be used to train/tune and FDD tool before it is installed, an adaptable tool for various types of chillers. To eliminate current field requirements of generating fault cases.
- Agami will draft an RTAR before the next meeting.

Current Research Projects

Evaluation and Assessment of Fault Detection and Diagnostic Methods for Centrifugal Chillers – Phase II – T. Agami Reddy, Drexel University.

Appendix D.

TC 7.5 Communications/Integration Subcommittee

June 27, 2004, Nashville, TN

Subcommittee Chair: Peng Xu

Meeting notes: Peng Xu

Brainstorming new ideas, new ideas:

Development of different demand limiting strategies for different buildings, in response to a certain amount of shed required. This might include small buildings, large buildings, and residential buildings. Carlos's idea. Carlos will write something on that.

Development of a "What if" tool, predictive control tool. What is the consequence of certain actions by building operators? One idea is to populate the database generated from simulation. Problem: how to be more generic? How will the rule of thumb apply to individual buildings? Steve Blanc

Development of a "What to do" tool. What should building operator do under certain demand-limiting requirement? Les Norford. "Short-term load control in building via HVAC setpoint adjustment".

Integration of maintenance and EMCS system, Cliff Federspiel

"Self configured control system", discuss it with Mike before the general meeting on Tuesday. Comments from Phil Haves includes how to complement the on-house activities and why instead of having control company doing this.

Appendix E.

Testing and Evaluation Sub-Committee Meeting

June 27, 2004, Nashville, TN
Subcommittee Chair: Natascha Castro
Meeting notes: Srinivas Katipamula

Natascha listed two items for discussion, WS-1312 and an RTAR-“Fault Detection for Centrifugal Chillers – Phase 3: Real-Time Implementation.”

John House discussed work statement titled “Tools for Evaluating FDD Methods for Air-handling Units” - WS-1312 (co-sponsors TC 1.4, TC 7.3, and TC 7.4). This WS was conditionally approved, will move forward as soon as forward cooling coil model is completed (RP-1194). Jim Braun indicated that the model should be completed and documented by late Fall 2004. Model is completed, but validation is not done yet.

Natascha presented the next item for discussion, the RTAR titled, “Fault Detection for Centrifugal Chillers – Phase 3: Real-Time Implementation.” The RTAR was prioritized by RAC, however, RAC suggested that the TC delay submitting a work statement until the second phase of RP-1275-RP is completed. This is currently 18 months off.

Phil, asked if any manufacturers developing FDD products for chillers? Jim Braun indicated that UTC has been doing a lot of work, but don’t know when they would have a product. Small companies are not doing any work yet. Jim though there a value to do the research.

Srinivas mentioned that many manufacturers have been talking about FDD products for a long time, but we haven’t seen any product yet.

Mike Brandemeuhl suggested we talk to TC 8.2 Centrifugal Chillers. Mike will talk to the TC tomorrow. Todd said he can follow up with TC8.2 also.

John asked it we want to draft an outline for the work statement? We probably won’t know what industry is doing by Tuesday. Srinivas mentioned that there we need a solution to existing chiller installed in the field. Todd commented that if phase-2 results don’t impact phase-3 work statement, we should start drafting the work statement.

Srinivas volunteered to lead the work statement, with help from John, Natascha, Jim and Todd.

Appendix F.
List of Subcommittee and Committee Attendees
Nashville, TN – June 2004

	Main Committee	Technology Development	Communications & Integration	Testing & Evaluation	Research
Voting Members					
Osman Ahmed (V)	X				
Michael Brandemuehl (V)	X	X	X	X	
James Braun (V)	X	X	X	X	
Natascha Castro, Testing & Eval Subc, Web Master (V)	X	X	X	X	X
Arthur Dexter, International Member (V)					
Cliff Federspiel (V)		X	X		
James W. Gartner, CM	X				
Rich Hackner, Program Subc. (V)					
Carlos Haiad, (V)	X	X	X	X	X
Phil Haves, (V)	X	X	X	X	X
John House, Chair	X	X	X	X	X
Srinivas Katipamula, Tech. Dev. Subc. Chair (V)	X	X	X	X	X
Agami Reddy (V)	X	X	X	X	X
Jonathan Wright, International Member (V)	X	X	X	X	X
Non-Voting Members					
Eric Adams					
Narendra Amarnani					
Peter Armstrong					
Don Aumann					
Kim Barker					
Steve Blanc, CM	X	X	X	X	X
David Bornside					
Mike Brambley, Vice-Chair, Research Chair, CM	X	X	X	X	X
Dave Branson, CM		X			
Mark Breuker					
Barry Bridges, CM					
Marty Burns, CM					
Jim Butler, CM			X	X	X
Par Carling					
Daniel Choiniere		X	X	X	X
Christian Christiansen					
Maria Corsi, CM					
Charles Culp, CM					
Piotr Domanski		X	X	X	X
Jon Douglas					
Andy Drysdale					
Chris Early					

	Main Committee	Technology Development	Communications & Integration	Testing & Evaluation	Research
Thomas Engbring, CM					
Paul Francisco					
Adam Froehlich		X			
Theo Frutiger					
James W. Gartner, CM					
Brent Griffith					
Peter Gruber					
David Hansen					
Bill Healy		X			
Kirstin Heinemeier					
Gregor Henze					
David Holmberg					
Mark Johnson		X	X	X	X
David Kahn, CM					
George Kelly, CM		X	X	X	X
Richard Kelso					
Michael Kintner-Meyer					
Hofu Kiu					
Curtis Klaassen					
Erin Kruse					
Damian Ljungquist					
Carol Lomonaco, CM,					
Haorong Li					
Mingsheng Liu		X	X	X	
Tor Malmstron					
Rodney Martin					
Darrell Massie		X	X	X	X
Robert McDowall					
John Mitchell , CM					
Ron Nelson, CM					
Les Norford					
Zach Obert					
Robert Old, CM		X	X		
Vince Payne		X	X	X	X
Hung Mahn Pham, CM					
Kinga Porst, CM					
Michael Pouchak					
Andrew Price					
Barry Reardon, CM					
Wayne Reedy					
Paul Reimer					
Glenn Remington, CM					
Todd Rossi, CM, Secretary	X	X	X	X	X
Tim Salisbury					
Jeffrey Schein					

